Air venting system

Field of the invention

The invention relates to an air venting system for absorbing odors emanating from a waste treatment plant, installation, system, or from a conduit used for conveying waste materials

The prior art

The use of filtering system associated with an air inlet or air outlet has already been proposed.

For example, DE 196 23 053 discloses a filtration system of the gases emitted by a waste disposal unit. The filtration system has a filter unit for the prevention of odor nuisance from the waste disposal unit. The filter unit comprises a loose or packed balas, such as activated charcoal, said loose or packed balas being placed in a tube with outer wall presenting apertures and with a bottom plate forming a rest for the ballast. The air flow in this system is only upwards.

EP 1422354 discloses an air venting system comprising a body with upper inlet openings and an outlet opening. The body has a base, an outer wall and an inner wall, with a gap between the walls forming a ring zone adapted for receiving or collecting water, said ring zone comprising two ring chambers provided with passage. The insert carries a filter at its upper end to absorb gas odors,. The cover closing the body prevents the entry of dirt by using a trap, with a center section over the filter and outer passage openings forming the inlet opening.
When water is collected in the chambers, air entering by the openings is moved first downwardly and then upwardly, before entering the zone above the filter and before flowing through the odor absorbing filter.

When making the downward and upward movements at the top of the chamber, the air is not submitted to a deodorization step. The air does not flow in an odor absorbing means when making said downwards and upwards movement.

DE 20317812 discloses a casing with an upper opening provided with a filter, the case is provided with a cover protecting the upper face of the casing and the filter. A passage is formed between the cover and the upper face of the casing for enabling the gas flowing through the filter to flow in said passage towards the outside. There is no downward and upward movement of the gas in the filter when flowing towards the passage and the outside.

JP 2000 283453 disclosed a charcoal filter provided in the exhaust top for absorbing odors. The gas after being treated by the charcoal filter is submitted to an upward and downward movement. In no way, during the downward movement, the gas is contacting an odor absorbing means.

In the United States and Canada, a product known as « Odorhog » ™ is marketed as septic vent pipe filter for preventing problems due to odors from septic tanks. The filtering system comprises a tube in which the charcoal filter is placed. The air flow in the OdorHog device is only upwards.

The major problems of all the filtering system of the prior art are efficiency, clogging and airflow restriction. In the filtering system of the prior art, it is necessary to use charcoal filter with a quite high length, whereby causing an important venting restriction and whereby many gases will be kept in the waste or septic tank or waste drainage system, such as waste water drainage system. This could then cause odors to escape via any other venting systems, leaks in the plumbing system, and even possibly when using the toilets.

The present invention has for aim an compact filtering system which is efficient, while having a reduced air flow restriction. These results have been achieved by

using a system whereby the gas to filtered flows according to a path in the odor absorbing means comprising an upwards flow portion and a downwards flow portion.

Brief description of the invention

The invention relates to an air venting system for a gas exhaust conduit of waste treatment system or waste conveying system or substantially closed waste container, said system comprising :

- a body defining an inner chamber; said body having at least one inlet opening intended for receiving gases from the gas exhaust conduit and at least one outlet opening intended for releasing gases out of the body, and
- at least one odor absorbing means placed in the inner chamber, said odor absorbing means having an inlet surface (inlet through which the odorous gas from the waste treatment system or conveying system enters into the odor absorbing means) and an exhaust surface (exhaust through which the odor absorbing means flows outside the odor absorbing means, said odor being preferably ready to flow outside of the air venting system through the outlet opening),

whereby the system is adapted for defining a gas flowing path between the inlet surface and the exhaust surface of the odor absorbing means, said flowing path in the odor absorbing means having at least a first flow path portion with a first flow direction defined by at least one vector and a second flow path portion with a second flow direction defined by at least one vector, whereby at least one vector of the second flow direction is opposite to a vector of the first flow direction.

Preferably, the system is adapted for defining a gas flowing path between the inlet opening and the outlet opening, said flowing path comprising at least an upwards flow path portion and a downwards flow path portion.

Advantageously, the system is adapted for defining a gas flowing path between the inlet opening and the outlet opening, said flowing path defining at least an upwards flow path portion and a downwards flow path portion in the odor absorbing means.

Advantageously, the odor absorbing means is placed in the inner chamber so as to define a volume free of odor absorbing means, whereby gas flowing from the inlet opening towards the outlet opening flows at least partly from the inlet opening through a portion of the odor absorbing means towards the volume free of odor absorbing means, and through another portion of the odor absorbing means from the volume free of the odor absorbing means towards the outlet opening. Such a free volume is able to form a buffer volume, suitable for having a better distribution of the gas to be treated after an upwards flow, for its downwards flow.

Preferably, the odor absorbing means is placed in the inner chamber so as to define a volume free of odor absorbing means, whereby gas flowing from the inlet opening towards the outlet opening flows at least partly according to an upwards flow path from the inlet surface of the odor absorbing means and through a first portion of the odor absorbing means towards the volume free of odor absorbing means, and at least partly according to a downwards path from the volume free of the odor absorbing means towards the exhaust surface thereof through at least a second portion of the odor absorbing means.

According to a detail of a preferred embodiment, in which the inner chamber is defined by at least one wall, the odor absorbing means is placed in the inner chamber so as to define between the said at least one wall of the chamber and the odor absorbing means a space free of odor absorbing means but closed by said odor absorbing means, whereby gas flows in or out said space only through the odor absorbing means. Gas flowing from the inlet opening towards the outlet opening flows (preferably at least partly upwardly) from the inlet opening through a portion of the odor absorbing means towards the volume free of odor absorbing means, and (preferably at least partly downwardly) through another portion of the odor absorbing means from the volume free of the odor absorbing means towards the outlet opening. The junction or connection between the wall or walls of the chamber and the odor absorbing means is thus substantially gas tight.

Most preferably, the odor absorbing means is a charcoal containing absorbing means. The odor absorbing means can comprise further agent(s) and/or additive(s), such as biocides, bactericides, virucides, fungicides, etc., and mixtures thereof.

According to an embodiment, the odor absorbing means has an inlet surface and an exhaust surface, whereby gas flowing from the inlet opening towards the outlet opening flows in the odor absorbing means through the inlet surface and outlet the odor absorbing means through the exhaust surface, whereby the exhaust surface is at least greater than the inlet surface, preferably greater than 1.5 times the inlet surface, most preferably comprised between 1.5 and 5 times the inlet surface.

According to a preferred embodiment, the air venting system comprises a tubular body defined by a cylindrical wall and extending between a bottom end up to a top end, a cover cooperating with the top end of the tubular body to form a chamber extending above the top end of the tubular body and associated with a peripheral channel extending outlet the cylindrical wall of the tubular body , whereby the bottom end of the tubular body defines the inlet opening, while the peripheral channel is provided with at least one outlet opening, and whereby the odor absorbing means is located at least partly in the chamber.

According to a detail of said embodiment,

- the odor absorbing means is located as least partly in the chamber, as well as partly in the peripheral channel or
- the odor absorbing means is located as least partly in the chamber, as well as partly as in the tubular body or
- the odor absorbing means is located as least partly in the chamber, as well as partly as in the tubular body and at least partly in the peripheral channel.

According to a specific embodiment, the odor absorbing means has the form of a body, said body having a circular groove in which the top end of the tubular body is introduced. Such a body can have the form of a cassette, which can be easily be replaced when required.

The invention relates also to a process in which the odor emanating from a venting conduit connected to a waste treatment station, plant such as septic tank, etc., or a conduit for conveying waste materials, such as drain, sewer, main sewer, etc.

The invention further relates to a waste containing system selected from the group consisting of waste treatment system, waste conveying system and substantially closed waste container, said waste containing system being provided with at least one gas exhaust conduit provided with an air venting system of the invention, as disclosed hereabove, in the preferred examples shown on the attached drawings and in the claims.

Details and characteristics of preferred embodiments will appear from the following description in which reference is made to the attached drawings.

Brief description of the drawings

Figure 1 is a cross section view of a first embodiment.
Figure 2 is an exploded view of the various parts of the first embodiment of figure 1.
Figure 3 is a cross section view of a second embodiment.
Figure 4 is a schematic exploded view of a third embodiment.
Figures 5 and 6 are cross sections views of the third embodiments along the lines V-V and VI-VI.

Description of preferred embodiments

Figures 1 and 2 are views of a first embodiment of an air venting system of the invention.

The air venting system 1 comprises :

- a tubular body 2 defined by a cylindrical wall 3 and extending between a bottom end 4 up to a top end 5,
- a cover 6 cooperating with the top end 5 of the tubular body 2 to form a chamber 7 extending above the top end 5 of the tubular body 2 and associated with a peripheral channel 8 extending outside a portion of the cylindrical wall 3 of the tubular body 2 .

The bottom end 4 of the tubular body 2 defines the inlet opening 9, while the peripheral channel 8 is provided with at least one outlet opening 10.

The odor absorbing means 11 is located as least partly in the chamber 7, partly in the peripheral channel 8 and partly in the tubular body 2. The odor absorbing means has the form of a body 11, said body 11 having a circular groove 12 in which the top end 5 of the tubular body 2 is introduced.

The tubular body 2 is provided with a flange 13 showing openings 10, possibly provided with screen, such as metallic screen 14. The flange 13 is provided at its end with a ring 15 provided with means for cooperating with a portion of the cover 6, so as to enable its fixation.

The odor absorbing means 11 has an upper face 16 which is spaced from the top inner face of the cover 6, whereby defining a volume 17 in the chamber 7 which is free of odor absorbing means, i.e. a buffer volume. The odor absorbing means 11 has an inlet surface 11A and an exhaust surface 11B, whereby the exhaust surface 11B is greater than the inlet surface. The exhaust surface 11B is distant from the flange 13 and the screen 14. In this example the exhaust surface is from about 3 to 10 times greater than the inlet surface.

The cover can be provided with a means for pushing the odor absorbing means towards the cylindrical body 2, such a means 20 being for example a button placed at the center of the inner top face of the cover.

The working of the air venting system of figure 1 is as follows :

The odor emanating from a tank, such as a septic tank, a sewer, or a draining system are moving upwards in the circular body 2, said odor entering into the odor absorbing means 11 through the inlet surface 11A. In said odor absorbing means 11, the odor flows first upwardly in the portion of the absorbing body 11 within the circular body 2. After said absorbing portion, the odor flows partly upwardly towards the volume 17 free of odor absorbing means before flowing back in the portion of the odor absorbing means adjacent to the exhaust surface 11B, and partly transversally into the portion of the odor absorbing means adjacent to the exhaust surface 11B. The air or gas escaping the odor absorbing means are exhausted via the screen 14.

The top portion of the cylindrical body 2 forms thus a partition wall in the odor absorbing means.

In said embodiment, a substantially air tight connection is ensured between the odor absorbing means 11 and the partition wall 12, as well as between the odor absorbing means and the ring 15. The volume 17 free of odor absorbing means or the portion of the chamber 7 free of odor absorbing means is closed by said odor absorbing means 11, whereby gas flows in or out said space only through the odor absorbing means.

Air can also enter in the circular body 2 from the exterior.

The portion of the odor absorbing body 11within the circular body 2 is in close contact with the inner wall of the body 2 so as to avoid leaks between the odor absorbing body 11 and the inner wall of the circular body 2.

The odor absorbing body 11 can have the form of a cassette which can be replaced when required. The outer edge of the cassette are for example made of a porous skin or layer, such as a flexible skin made of woven material. The body is then for example containing fibers mixed with the active charcoal. The outer skin or layer

of the body 11 is advantageously treated or provided with a water repelling agent, such as a fluorosilane.

The thickness E of the body is advantageously at least 10cm, while the height H of the portion of the body 11 in the circular body 2 is at least 50% of the thickness of the body 11.

The volume of the odor absorbing body 11 is divided in two portions, namely a central portion defined by the portion defined by the groove 12 and its upwardly extension, and a peripheral portion located outside of the central portion, said peripheral portion having advantageously a volume at least equal, preferably greater than the volume of the central portion.

The volume free of odor absorbing means 17 can be used as means for ensuring preferably an upwards movement of the gas to be exhausted in the central portion of the odor absorbing means 11, and a good distribution of the flow of gas from the free volume 17 into the peripheral portion of the odor absorbing means 11.

Possibly the odor absorbing means can be formed by two or more independent parts, which are placed the one near the other in the chamber 7.

The embodiment of figure 3 is similar to the embodiment of figure 1, except that the odor absorbing means has a reduced thickness, so that substantially no portion of the odor absorbing means extends in the cylindrical body 2. The odor absorbing body 11 is provided with an inner cylindrical wall 11W, so as to define in said odor absorbing means a central portion and a peripheral portion. The inner wall 11W is adapted for resting on the top edge of the cylindrical body 2. The inner wall is advantageously provided with a sealing means 11S so as to make a correct sealing between the bottom edge of the inner wall 11W and the top edge of the cylindrical body 2. The inner edge extends for example substantially in all the thickness of the odor absorbing means, so that the gas emanating from a septic tank, a sewer or a

waste (water) draining system flows substantially only from the body 2 into the free volume 17 of the chamber 7 through the central portion of the odor absorbing body, and then from said free volume 17 of the chamber towards the exhaust opening 10 through the peripheral portion of the odor absorbing body 11.

The embodiment of figure 4 is similar to the embodiment of figure 1, except that the chamber 7 intended to contain the odor absorbing means 11 has a specific shape. The chamber 7 is defined between the cover 6 and an extension 2A of the circular body 2. The filtering body 11 comprises four different portions 110,111,112,113 intended to be located each in a specific portion of the chamber 7. The filtering body 11 comprises:

- a substantially cylindrical top element 110, said top element bearing on its bottom face the three elements 111,112 and 113,
- the element 111 having a substantially 8-shape with a thickness varying between a minimum at its central portion and a maximum at its end adjacent to the exhaust opening 10,
- the elements 112 and 113 being located each in the gap of the 8-shaped element 111, said elements 112,113 being separated from the element 111 by a groove 118 intended to receive a separating wall 120 extending between the inlet opening 125 of the extension 2A and the exhaust opening 10.

Above the filter 11, a closed volume 17 free of odor absorbing means 11 is defined.

The inlet openings 125 are provided with a screen 126 acting as supporting means for the bottom faces of the elements 112 and 113, while the exhaust openings 10 are provided with a screen 14 acting more as protection means.

The working of the air venting device of figure 4 is as follows :

The odor emanating from a septic tank or a sewer or a waste drainage system flows in the pipe 2. When the odor arrives in the extension 2A, the odor flow is split in

two distinct flows, namely a first flow flowing in the filtering element 112 and a second flow flowing in the filtering element 113. In said filtering elements 112,113, the gas containing odor flows upwardly towards the upper filtering portion 110 and the free volume 17 of the chamber 7. The gas containing possibly some odor after its upwardly flows in the filtering elements 112,113, is split, namely a first portion of gas flowing in the left portion of the filtering element 111 before being exhausted via the exhaust opening 10A, and a second portion of gas flowing in the right portion of the filtering element 111 before being exhausted via the exhaust opening 10B. In the filtering element 111, the gas flows downwardly and transversally towards the exhaust faces 111A, 111B, before being exhausted via the exhaust openings 10A,10B.

In this embodiment, the inlet faces 112A,113A of the filtering elements 112,113 have a total inlet surface corresponding substantially to the sum of the surfaces of the two exhaust faces 111A,111B of the filtering element 111.

Advantageously the element 111 has two protrusions 111C,111D, the top of which being adjacent to the exhaust openings. A bottom face of each protrusion rests on a closed inclined face of the extension 2A. The height H1 and the length L1 of a protrusion is higher than the thickness E1 of the substantially cylindrical top portion 110 of the filtering element, so that the gas flows preferably upwardly towards the top free volume 17, before being redistributed and flowing downwardly into the filtering portion 111, more specifically in the protruding portions 111C,111D.

According to possible embodiment, the filtering body 11 is not provided with the portion 111 or with the portions 112,113.